

Chapter 5

WATER SOURCE OPTIONS AND SOLUTION DEVELOPMENT

Chapter 4 described the results of the analyses that were performed and identified the issues that may be of concern in the future. Several water source options were considered to address the water supply issues identified. These options were developed to address the distinct water resource issues in the Orange-Osceola County Area and Lake Istokpoga-Indian Prairie Basin (**Table 7**).

The options listed in **Table 7** reflect the consensus of the advisory committee. This chapter represents a summary of the thoughts expressed by the advisory committee to the District through written comments and input collected as part of the advisory committee meetings and information presented to the committee by the District. Each water source option discussed in this chapter contains a summary of the committee meeting discussions followed by a listing of the suggested recommendations to be considered by the District. These committee recommendations and comments were reviewed by the District and then formulated into strategies as part of Chapter 6. The views expressed in this chapter are the views of advisory committee members or District staff, but reflect the input and, largely, consensus of the committee.

Table 7. Overall Water Source Options of the Kissimmee Basin Planning Area.

Water Source Option	Orange-Osceola County Area	Lake Istokpoga- Indian Prairie Basin
Stormwater Drainage Well	X	N/A
Stormwater Reuse	X	N/A
Wastewater Reuse	X	N/A
Urban Conservation	X	N/A
Agricultural Conservation	X	X
Floridan Aquifer	X	X
Surface Water	X	X
Brackish Ground Water	X	N/A
Reservoirs	X	X
Aquifer Storage and Recovery	X	X
Surficial Aquifer	X	X

N/A = not applicable.

During the initial identification of water supply issues within the Kissimmee Basin (KB) Planning Area, it became apparent to the advisory committee that two distinct regions, each with their own unique issues, could be distinguished. Overall, the advisory committee identified 11 water source options for the entire KB Planning Area. The committee also decided it would be best to address the water supply options surrounding surface water use in the Lake Istokpoga-Indian Prairie Basin as part of a separate subcommittee or focus group. The full advisory committee focused on the water source options in the Orange-Osceola County Area, which are geared towards addressing the potential impacts to natural systems associated with use of the Floridan aquifer in southern Orange County and northern Osceola County. Likewise, the focus group addressed the issue of surface water availability in the Lake Istokpoga-Indian Prairie Basin. Each group considered options according to their potential to address water resource issues in their respective areas.

There are several important issues related to water supply planning, but are not addressed as part of this plan. Among these are watershed issues, flood control and land management. Concerns were raised by members of the committee related to unregulated drainage activities in the area of Gore, Ash, and Chandler sloughs and the resulting flooding that has occurred. Although these issues are important to the District and will continued to be addressed, this plan's focus is on water supply and does not examine these issues.

WATER RESOURCE DEVELOPMENT AND WATER SUPPLY DEVELOPMENT

Amendments to Chapter 373, F.S. require that water supply plans include a list or menu of water source options for water supply development for local water users to choose from. For each source option listed, the estimated amount of water available for use, the estimated costs, potential sources of funding, and a list of water supply development projects which meet applicable funding criteria should also be provided. In addition, water supply plans must also include a listing of water resource development projects that support water supply development. For each water resource development project listed, an estimate of the amount of water to become available, timetable, funding, and who will implement, are required. These amendments were passed in 1997 and are addressed here and in Chapter 6 of this document.

The statute defines water resource development and water supply development as follows:

"Water resource development" means the formulation and implementation of regional water resource management strategies, including the collection and evaluation of surface water and ground water data; structural and nonstructural programs to protect and manage water resources; the development of regional water resource implementation programs; the construction, operation, and maintenance of major public works facilities to provide for flood control, surface and underground water storage, and ground water recharge augmentation; and

related technical assistance to local governments and to government-owned and privately owned water utilities.

and,

"Water supply development" means the planning, design, construction, operation, and maintenance of public or private facilities for water collection, production, treatment, transmission, or distribution for sale, resale, or end use.

The categorization of projects as "water resource development" or "water supply development" has received both water management district and statewide attention. Water management district budget decisions and state funding responsibilities will be influenced by how these terms are implemented. Interpretation of these terms in the water supply planning process will be driven by considerations from many forums, including the Governor's Office, the legislature, the Department of Environmental Protection, other water management districts, and stakeholder groups, such as the KB Water Supply Plan advisory committee.

For the purposes of this report, the advisory committee and the District agreed that the water management district is responsible for water resource development to attain the maximum reasonable-beneficial use of water; to assure the availability of an adequate supply of water for all competing uses deemed reasonable and beneficial; and to maintain the functions of natural systems. Local users have primary responsibility for water supply development and choosing which water source options to develop to best meet their individual needs.

For an option to be a water resource development project, the following considerations should be taken into account:

- Opportunity to address more than one resource issue
- Address a variety of use classes (e.g., environment, public water supply)
- Protect/enhance resource availability for allocation
- Move water from water surplus areas to deficit areas
- Broad application of technology ("broad-reaching")

For an option to be a water supply development project, the following considerations should be taken into account:

- Localized implementation of technology
- Delivery of resource to consumer
- "Regionalized" interconnects to consumer

WATER SOURCE OPTIONS AND STRATEGIES

Water source options and strategies are organized in this chapter into the Orange-Osceola County Area and the Lake Istokpoga-Indian Prairie Basin. Each section describes the pertinent characteristics of each option, including cost, feasibility, permitability, constraints, and quantity. Advisory committee recommendations follow each option.

Orange-Osceola County Area

The advisory committee reviewed the water source options to assess those that had the most potential to address the greatest number of potential water resource issues in the Orange-Osceola County Area (**Table 8**). The issues in this area include greater wetland vulnerability, reductions in spring discharge, possible saline water movement, and increased risk of sinkhole formation.

Table 8. Results of Water Source Options Ranking for the Orange-Osceola County Area.

Water Source Options	Water Resource Issues				
	Wetland Vulnerability	Spring Discharges	Saline Water Movement	Sinkhole Formation	Overall Ranking
Wastewater Reuse	H	H	H	H	H
Surface Water	M	M	M	M	M
Reservoirs	M	M	M	M	M
Aquifer Storage and Recovery	M	M	M	M	M
Stormwater Drainage Wells	L	M	H	L	M
Stormwater Reuse	M	M	M	L	M
Urban Conservation	L	L	L	L	L
Agricultural Conservation	L	L	L	L	L
Surficial Aquifer	L	L	L	L	L
Brackish Water	L	L	N/A	N/A	L
Floridan Aquifer	L	L	L	L	L

N/A = Not applicable: Does not address water resource issues.

L = Low: Least potential to address water resource issues.

M = Medium: Moderate potential to address water resource issues.

H = High: Most potential to address water resource issues.

In this ranking process, wastewater reuse was identified as the water source option with the most potential. The water source options presented in **Table 8** are listed in the order ranked by the committee. As indicated in the table, the Floridan aquifer remains a viable source of water for the immediate future. However, the analyses performed in this plan suggests that the withdrawals occurring in Orange and Osceola counties by 2020 will place these areas at the greatest risk of causing harm to wetlands, reduced springs discharges and inducing saline water movement. Although these areas are identified as being at greater risk, a number of issues must be resolved prior to fully determining whether there is sufficient or insufficient water available from the Floridan aquifer to meet the 2020 demands. To this end, the District has identified recommendations in Chapter 6 that address these unresolved issues through future studies, modeling and pilot projects. Chapter 6 also includes recommendations that seek to develop facilities to deliver alternative sources of water.

Wastewater Reuse

Wastewater reuse is an important water source option in the Orange-Osceola County Area. It was the highest ranked of all options considered by the advisory committee (see **Table 8**). It was ranked high in addressing the four water resource issues while minimizing the costs of developing a new source. Wastewater reuse has a long history in the Central Florida area. For instance, Conserv II, one of the world's largest reuse projects, has been operating for nearly 20 years and today transports nearly 30 million gallons per day of reclaimed water to high recharge areas in Orange County. Nearly every utility in the Central Florida area has identified some type of ongoing reclaimed water project.

Certain applications of wastewater reuse are more beneficial than others. In evaluating the potential impact that wastewater reuse may have, it is important to understand how reuse might best be applied to maximize its long-term potential benefits. **Figure 13** briefly describes a scale of the most to least beneficial use of reclaimed water in offsetting demands from the Floridan aquifer.

Any of the identified types of wastewater reuse applications may have multiple benefits that would raise or lower the application in its beneficial use. **Table 9** shows a summary of the existing disposal methods used by the various utilities within the KB Planning Area. These disposal methods have been separated by lower and higher efficiency type uses. Lower efficiency uses include surface water discharges and infiltration basins located in lower recharge areas. Higher efficiency type uses include direct offset of demand, infiltration ponds in high or moderate recharge areas to the Floridan aquifer, and direct injection. The table also indicates the potential increases in reuse assuming all newly developed wastewater is applied in the most beneficial manner and that current lower beneficial uses will improve.

The volume of wastewater within the District's portion of Orange and Osceola counties is projected to more than double from the existing 61 MGD to 136 MGD by the year 2020. In 1995, an estimated 49 MGD of treated wastewater was used to replace

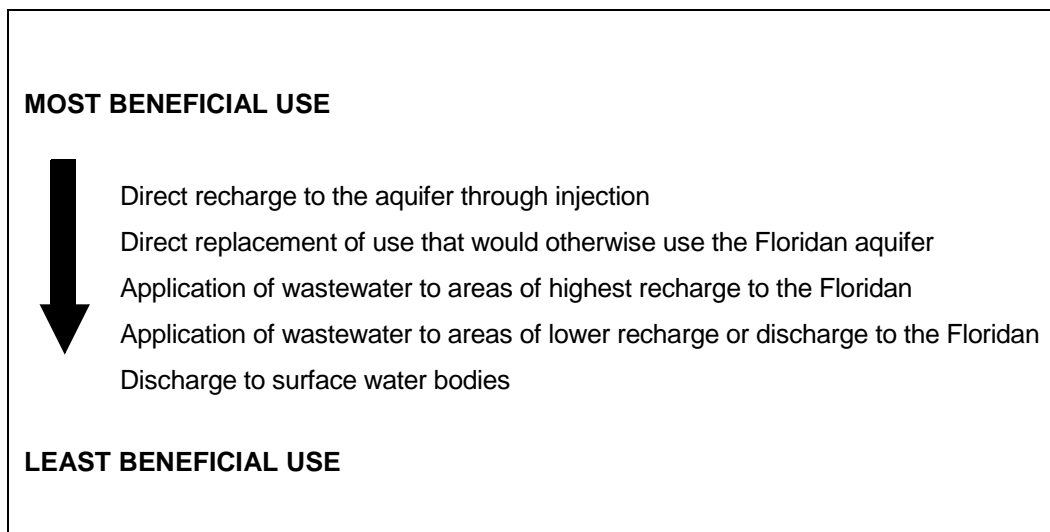


Figure 13. Scale of the Most to the Least Beneficial Uses of Reclaimed Water.

Table 9. Summary of Wastewater Facility Disposal Methods within the Kissimmee Basin Planning Area.

Facility	1995 Avg. Flow	Disposal System		2020 Projected Avg. Flow (MGD)	2020 Projected High Beneficial Use (MGD)
		Lower Efficiency Application (MGD)	Higher Efficiency Application (MGD)		
Okeechobee Utility	0.47	0.24	0.23	0.47	0.24
Orange Co. Utility	18.26	0.00	18.26	41.44	22.85
City of Orlando	18.99	2.26	16.73	32.50	15.77
Reedy Creek	9.03	0.00	9.03	25.00	15.97
Buenaventura Lakes	1.48	1.31	0.17	1.98	1.31
City of Kissimmee	9.45	5.07	4.06	26.00	23.92
City of St. Cloud	1.65	1.53	0.12	4.60	4.48
Poinciana Utilities	1.26	0.87	0.39	3.84	3.52
Total	60.59	11.28	48.99	135.83	88.06

irrigation demand or for application in high or moderate recharge areas. The volume of additional wastewater that could be available for beneficial uses by 2020 is estimated at 88 MGD. Direct offset of demand and recharge to the Floridan aquifer are among the most beneficial uses and should be preferred where economically feasible.

Although **Table 9** identifies potential for future utilization of reuse, several factors such as storage, supplemental sources and utility interconnects need to be addressed before a significant portion of the capacity may be realized. Storage is necessary to address because wastewater for reuse is produced on a fairly consistent basis year-round. Demand for reuse is seasonal, however, peaking in the drier winter/spring months. This typically results in disposal during the rainy summer months when the demand for reuse water is low, and problems meeting demand during the dry months. Providing storage for reclaimed water during the wet season would address this seasonal discrepancy between production and demand and increase the amount of annual reuse. The addition of back-up freshwater supply wells can also help reduce this discrepancy.

Another concern over reuse is the perception of some customers that reuse is a commodity to be wasted. It is not uncommon that when a reuse system replaces a conventional freshwater tap, consumption by the end user will rise significantly. This problem may be best addressed through education, appropriate rate structures or use restrictions.

Table 10 provides a summary of the characteristics of the option followed by a series of recommendations for implementing this option.

Table 10. Characteristics of the Wastewater Reuse Option.

Cost	Different in Orlando vs. southern Kissimmee Basin Moderate - incremental costs to wastewater treatment (about \$1 per 1,000 gallons), cost can be partially offset by wastewater treatment costs
Feasibility	Technically feasible, advancing technology has improved dependability, perception of public has become more acceptable with the exception of direct injection
Implementing Agency	Utilities and some private entities, WMD, and FDEP
Permittability	Very permittable, except for direct injection
Quality	Improvements in water treatment methods have reduced the risk of "spikes"
Quantity	Potentially large increase in upper basin of the Kissimmee Basin Planning Area; less availability expected in the lower basin Estimated Quantity Made Available by 2020: 136 MGD, of which 88 MGD is available for beneficial uses
Constraints	Water quality, operation and maintenance costs, transport radius from WWTP, storage
Other	Recharge Floridan through injection or RIBs, possible interconnects between utilities could improve availability; location critical
Summary	Wastewater reuse is highly viable source of water for the future. Projections of urban growth for the upper basin suggest 88 MGD of additional use will be available for beneficial uses; less will be available in the lower basin. Improving reuse availability is limited by location of suitable sites and WWTP treatment capacity, as well as storage.

Recommendations

- Encourage efficient use of reclaimed water.
- Focus the use of reclaimed water in high recharge areas.
- Investigate potential cost-share options and other financial incentives for construction of reclaimed water systems to use reclaimed water for recharge.
- Investigate the potential for utility interconnects to improve availability of reclaimed water.
- Consider the use of reclaimed water for lake augmentation and other forms of regional storage.
- Encourage the development of reclaimed water master plans that include where injection should occur.

Surface Water

The use of surface water was also considered as an option to meet future demands. The advisory committee gave it an overall ranking of medium. Several issues were identified related to the use of surface water. Some of the issues are technical and resource based, while others are related to coordination with other water management districts, and state and federal agencies.

In order to understand the availability of surface water to satisfy future demands, it is necessary to consider technical factors which both provide the framework for permitting decisions and operate to restrict the amount of water available for allocation. First, pursuant to Parts II and IV of Chapter 373, surface water management and consumptive use permitting regulatory programs must prevent harm to the water resource. Whereas water shortage statutes dictate that permitted water supplies must be restricted from use to prevent serious harm to the water resources. By contrast, MFLs are set at the point at which significant harm to the water resources, or ecology, would occur. The levels of harm cited in Chapter 4, harm, significant harm, and serious harm, are relative resource protection terms, each playing a role in the ultimate goal of achieving a sustainable water resource. In order to properly manage the resource, including issuance of consumptive use permits, it is necessary to define water availability or restrictions in light of this construct.

The process of establishing minimum flows and levels (MFLs) for the Kissimmee Chain of Lakes would provide the basis for identifying the amount of water that could be withdrawn from the Chain of Lakes without causing significant harm to the lakes. MFLs are scheduled to be prepared by 2004 for the Kissimmee River and Lake Kissimmee, and by 2006 for East Lake Tohopekaliga, Lake Tohopekaliga, Alligator Lake, Lake Hatchineha, Cypress Lake, Fish Lake, Lake Jackson, Lake Marian, Lake Pierce, and Lake Rosalie.

As mentioned, minimum flows and levels are the point at which further withdrawals would cause significant harm to the water resources. Significant harm is recommended to be defined as a loss of specific water resource functions that take multiple years to recover, which result from a change in surface water or ground water hydrology. According to the resource protection framework above, this level of harm requires that consumptive uses be cutback heavily, imposing the potential for economic losses, to prevent significant harm and serious harm. This shared adversity between the environment and water users is implemented through the water shortage program discussed in Chapter 4.

Section 373.0421, F.S. requires that once the MFL technical criteria have been established, the District must develop a recovery and prevention strategy for those water bodies that are expected to exceed the proposed criteria. It is possible that the proposed MFL criteria cannot be achieved immediately because of the lack of adequate regional storage and/or ineffective water distribution infrastructure. These storage and infrastructure shortfalls will be resolved through water resource development and water supply development projects, construction of facilities, and improved operational

strategies that will increase the region's storage capacity and improve the existing delivery system.

Issues related to coordination with other water management districts include a preliminary study completed by CH2M Hill (1997) for the SJRWMD examining the feasibility of the St. Johns River as a possible source of brackish water for Central Florida. Under this investigation, they evaluated five sites along the river including Lake Monroe and the river near the city of Cocoa. Results of this work indicated that peak yields as high as 300 MGD might be obtainable from the St. Johns River on a seasonable basis. Cost feasibility obtained from this study estimates the costs associated with the treatment, storage and transport of the river water is \$2.10 per 1,000 gallons.

Coordination issues related to the use of surface water are important and ongoing. SFWMD, SJRWMD, and SWFWMD have been working closely over the years to address common and related water supply issues. These efforts are expected to continue and expand over the next five years. A later section in this chapter entitled "Related Strategies" outlines the specific recommendations to address this important issue. **Table 11** provides a summary of the characteristics of this option, and is followed by the committee's recommendations.

Table 11. Characteristics of the Surface Water Option.

Cost	Costs for pumping surface water is lower than ground water, however, treatment costs of surface water can be very high especially for public water supply
Feasibility	Highly feasible for agricultural and landscape use
Implementing Agency	Utilities/land owner, WMD/FDEP (PWS)
Permitability	Moderate to difficult - PWS Less difficult - agriculture
Quality	Sufficient for irrigation uses Additional treatment required for public water supply
Quantity	Kissimmee River - offline storage 200-300 MGD from St. Johns River (from SJR study) Estimated Quantity Made Available by 2020: Further research is needed to quantify this amount
Constraints	MFLs - environmental Operational schedules Flood protection Fish/wildlife values Agency and local government permitting and coordination Lack of storage to address fluctuating availability
Other	Reservoirs - need for storage Reduce drainage which may impact natural systems
Summary	Surface water is a viable localized source, but has many environmental constraints. Transportation distance is limited due to cost of piping from limited individual sources.

Recommendations

- Identify potential sources, and amounts of surface water available that could be used to meet projected consumptive use demands in the Orange-Osceola County Area.
- Assess the potential for interdistrict transfers of water between SFWMD and SJRWMD.
- Establish MFLs by 2004 for the Kissimmee River and Lake Kissimmee, and by 2006 for East Lake Tohopekaliga, Lake Tohopekaliga, Alligator Lake, Lake Hatchineha, Cypress Lake, Fish Lake, Lake Jackson, Lake Marian, Lake Pierce, and Lake Rosalie (please refer to the "Minimum Flows and Levels" section later in this chapter).
- Identify potential impacts associated with using rivers and lakes for water supply on natural systems that are either adjacent to or hydrologically connected to these bodies of water.
- Identify and quantify environmental impacts of surface water use on lakes.
- Investigate the St. Johns River as a potential source.

Reservoirs

The reservoir (storage) option received an overall ranking of medium for addressing water supply in the Orange-Osceola Area; however, it has more potential in the lower basin of the KB Planning Area related to Lake Istokpoga concerns. This management option relates to surface water, as well as other sources, such as reclaimed water. **Table 12** summarizes the characteristics associated with the reservoir option.

Table 12. Characteristics of the Reservoir Option.

Cost	Relatively high due to land and operation and maintenance costs
Feasibility	Long-term fix which can be used quickly after installation
Implementing Agency	User, WMD, Army Corps, FDEP if used for drinking water
Permitability	Environmental concerns
Quality	Good for irrigation, requires treatment for drinking use
Quantity	Estimated Quantity Made Available by 2020: Unknown
Constraints	Willingness of property owners to sell large blocks of land Depth of water held in reservoir High ET losses
Other	Environmental concerns Provides surface water runoff treatment
Summary	Storage in the form of reservoirs is a viable local option best suited for agriculture, but may be suited to supplement urban irrigation systems

Recommendations

There are no recommendations appropriate for the Orange-Osceola County Area.

Aquifer Storage and Recovery

The concept of aquifer storage and recovery (ASR) was considered as a water supply option for the Orange-Osceola Area and was ranked medium. ASR can be used in three ways from a source perspective; (1) utilizing reclaimed water as a source for ASR, (2) utilizing treated potable water as a source for ASR, or (3) using untreated ground or surface water. The use of reclaimed water as a source for ASR in the Orange-Osceola Area was determined to be more viable than using treated water or untreated water.

The use of reclaimed water as a source for injection was determined to be more feasible than treated water primarily due to the greater certainty of the availability. The availability of reclaimed water as a source for ASR is more reliable and its use less costly than treated water. Reclaimed water could be used to improve the brackish zones of the Floridan by introducing less saline reclaimed water. By doing so, the Floridan could be recharged, making available more water for other users. If this were to occur, permitting concerns of the USEPA and FDEP would need to be overcome. In addition, zones of higher saline concentrations in the Floridan aquifer would need to be identified and targeted as receiving areas. This would need to be combined with an inventory of where and when reclaimed water would be available, thereby, optimizing the costs of co-locating the source of reclaimed water with the location of appropriate receiving zones of the Floridan.

The advisory committee thought the ASR concept had high potential with reclaimed water as a storage option. However, current regulations require injected water to meet primary drinking water standards when the receiving aquifer is classified as an underground source of drinking water, unless an aquifer exemption is obtained.

Within this area, the committee concluded that there is not an appropriate aquifer zone for ASR due to the lack of confinement. As a result, an ASR application becomes direct recharge (injection) into the Floridan aquifer.

The potential for using treated water as a source for ASR was thought to be very limited in the Orange-Osceola Area. The source of drinking water, for all practical purposes, is the same water that would be receiving injection. **Table 13** provides a summary of the characteristics of this option.

The focus group also discussed the potential of ASR to address water supply issues in the Lake Istokpoga area. This area has more favorable geology for ASR than the Orange-Osceola Area and may also benefit from an ongoing ASR pilot project, which is a component of the C&SF Restudy. This project is further discussed under the water source options for the Lake Istokpoga-Indian Prairie Basin.

Table 13. Characteristics of the Aquifer Storage and Recovery Option.

Cost	Cost of ASR wells is high, between \$500,000-\$1 million in initial costs
Feasibility	The feasibility of ASR is determined on a case-by-case basis. In general, it is still deemed a hi-tech solution that has proven itself in only limited, geologically favorable locations
Implementing Agency	User, WMD
Permitability	Difficult, except for treated potable water
Quality	Current USEPA standards require that all water entering ASR wells must meet primary drinking water standards.
Quantity	Estimated Quantity Made Available by 2020: Unknown
Constraints	Permitability issues, geology /hydrology must be conducive
Other	Part of the solutions proposed for the Restudy could affect the feasibility of ASR in the Metro Orlando Area.
Summary	ASR is generally an expensive option limited to urban utilities, which can defer the costs. ASR may have additional application in this planning area if combined with other ongoing efforts in the District.

Recommendations

- Investigate and identify potential receiving zones for ASR, especially in high recharge areas.
- If a suitable zone is identified, investigate and catalog the availability of using reclaimed water with appropriate receiving zones of the Floridan aquifer.
- Investigate reclaimed water ASR.

Stormwater Drainage Wells

According to the USGS, approximately 377 drainage wells are located in the Orange-Osceola Area. Estimates on the total amount of recharge from these wells to the Floridan aquifer ranges between 20 to 50 MGD. The wells are used as a means of disposal of stormwater. Typically the water entering these well is a result of overflow from lakes receiving stormwater; however, several wells exist that accept run-off directly from street drainage. Historically, the stormwater was not treated prior to entering the aquifer. More recently, some of the wells include a flow-through treatment technique to improve the quality of the runoff water prior to entering the aquifer. Under current regulatory requirements, any water entering an aquifer through a new drainage well would have to meet drinking water standards. Initial assessments of the potential increases in recharge to the Floridan aquifer in Central Florida through the addition of new drainage wells are estimated at as high as 50 MGD (CH2M Hill, 1999).

Stormwater drainage wells were given a ranking of medium by the advisory committee for addressing future water demands in the Orange-Osceola Area. Three major

benefits are associated with drainage wells. The first benefit is their potential contribution to meet the water supply demands in the area. The concept is that the stormwater drainage wells can be used to recharge the Floridan aquifer, thereby making more water available for consumptive use. The second benefit of drainage wells is to provide an increased level of service for flood control by providing a disposal method. Finally, the third benefit is to reduce reliance upon existing receiving water bodies.

Issues related to expanding the number and use of stormwater drainage wells include meeting drinking water (primary and secondary) standards for water entering any new wells. This requirement was established by USEPA to avoid the potential of permanently contaminating an existing freshwater source used for consumptive use. It is important to note that the FDEP and SJRWMD in conjunction with SFWMD are developing demonstration projects to use water treated to primary (except bacteria) and secondary standards for stormwater drainage wells. These standards are less stringent than the primary standards required by USEPA and, if determined acceptable by the USEPA and FDEP, have the potential of expanding the development of new drainage wells.

Due to water quality concerns related to the use of stormwater drainage wells, it is preferred to use drainage water from lakes instead of direct drainage from roads. The committee suggested that the East Orlando region may provide the most suitable region for expansion of stormwater drainage wells due to its poor drainage, projected urbanization, and related opportunities to incorporate water quality treatment components of new drainage systems. The cleaner water coming out of the new drainage systems could be used to feed new drainage wells. Another ongoing effort to evaluate the USEPA water quality standards for untreated or moderately treated injection water. **Table 14** provides a summary of the characteristics of this option, and is followed by a series of recommendations.

Table 14. Characteristics of the Stormwater Drainage Well Option.

Cost	Costs are comparable to that of normal well drilling - \$50,000-\$100,000 per well. Treatment costs would significantly increase this amount. Many of these costs however, may be offset by a reduction in stormwater drainage costs.
Feasibility	This is a long-term, regional solution that can begin implementation shortly pending completion of permitting hurdles
Implementing Agency	WMDs, FDEP, user
Permitability	Primarily through USEPA, but managed through local FDEP office. Stringent water quality requirement to meet for permitability.
Quality	Drainage from lakes is relatively good; water quality from lakes generally meets primary and secondary standards, except bacterial. Drainage directly from roads is generally poor.
Quantity	USGS estimates that the 377 existing drainage wells in the Orange-Osceola Area contribute between 20 and 50 MGD of recharge to the Floridan aquifer Estimated Quantity Made Available by 2020: 20-50 MGD
Constraints	Current permitting requirements have effectively put a moratorium on the installation of new drainage/injection wells
Other	Recharge of Floridan Good locations include the city of Orlando, poor drainage areas, and existing receiving water bodies
Summary	Drainage wells offer a relatively low cost water source alternative to increase recharge to the Floridan Aquifer System. The difficulty in regulatory permitting due to the potential risks associated with ground water contamination is the major constraint on this option.

Recommendations

- Promote and participate in demonstration projects that use water treated to primary and secondary standards for water entering drainage wells.
- Identify areas where new development is expected to occur in the East Orlando area that are appropriate for the expansion of stormwater drainage wells which would provide recharge to the Floridan aquifer.
- Continue to work with the USEPA and FDEP to evaluate water quality standards for water entering the Floridan aquifer if this would not contribute to harm to the aquifer.
- Conduct an inventory of drainage wells.
- Assess the impact on the hydrologic regime of natural communities that might be affected by water diversions associated with the development and use of stormwater drainage wells.

Stormwater Reuse

The advisory committee suggested that due to the high water treatment costs, stormwater reuse may be a more viable water source option for irrigation use. It was ranked medium by the committee in addressing wetland vulnerability, spring discharges, and saline water movement; and low for addressing sinkhole formation. **Table 15** provides a summary of the characteristics of this option, followed by recommendations.

Table 15. Characteristics of Stormwater Reuse Option.

Cost	Use of water for drinking supplies would have high cost. Costs for landscape or agricultural irrigation would be lower.
Feasibility	Very feasible for landscape and agricultural irrigation
Implementing Agency	Utilities and individual land owners
Permitability	Regional implementation or addition to drinking water supply may have a high cost factor
Quality	In urban systems water quality can be variable; in agricultural applications the water quality is generally acceptable
Quantity	Availability may be highly variable and may be limited during periods of drought Estimated Additional Quantity Made Available by 2005: Unknown
Constraints	---
Other	Recharge Floridan through injection Wetland mitigation value (requires suitable water quality) Supplemental to other systems
Summary	Stormwater reuse is most feasible for irrigation uses due to treatment costs. The dependability of stormwater requires that a backup source be available or that stormwater be designated as a supplemental source.

Recommendations

- Focus stormwater reuse in golf courses and public access irrigation areas, especially in new developments.
- Focus stormwater reuse capture in low recharge areas and use in high recharge areas.
- Look for opportunities to use as a supplemental source to reclaimed water.
- Evaluate the costs of regionally utilizing storm water.
- Promote the development of stormwater master plans.

Urban Conservation

Urban conservation was ranked low by the advisory committee in addressing the four water resource issues. **Table 16** provides a summary of the characteristics of this option. The primary reason it was ranked low was due to the efforts currently underway to address urban water conservation. Each consumptive use permit (CUP) issued to a utility includes a series of conservation strategies that must be implemented by the utility.

Table 16. Characteristics of Urban Conservation Option.

Cost	Costs of programs vary, but most are relatively inexpensive Some expensive options may not provide much water savings
Feasibility	Short term for educational (unless repetitive) Long term reduction for construction projects
Implementing Agency	Utilities, water management districts (rebate programs), local governments
Permitability	Through plumbing codes and building permits, water management district CUP Program
Quality	N/A
Quantity	5-10% reduction in public water supply on average; as much as 50% for specific cases Estimated Additional Quantity Made Available by 2005: 10 MGD
Constraints	Efficiency of existing system may limit additional gains Demographics (higher incomes use more water)
Other	Source of funding: impact fees, additional charges for higher use, District sponsorship of specific programs
Summary	Water conservation currently plays a role in reducing water demands. These efforts are relatively inexpensive when compared to other water reduction tools.

Several areas for improvement, however, were also identified. The existing CUP requirements apply a similar set of conservation requirements on each utility. A summary of conservation plan for each utility in the KB Planning Area is provided in Chapter 7 of the Support Document. This process could be improved by allowing the individual utilities to identify which of the conservation strategies presented in the CUP process are best suited to their utility. In essence, each utility would develop its own conservation plan choosing from a variety of conservation strategies such as dual distribution systems, rain sensors, Xeriscape™ and tie-in of water use into surface water permits for new developments. These individual select strategies would then be enforced for the utility, as opposed to all of the strategies being required for all utilities. The utilities would also be required to provide follow-up analyses to determine the effectiveness of the chosen strategies. This information would be consulted at the time the utilities come in for new permits.

Another suggestion for urban conservation is for the District to develop regional conservation plans. These plans would target specific conservation strategies to the most appropriate areas, regardless of utility service boundaries. Urban retrofit projects and public education campaigns were suggested as possible aspects of such a conservation plan.

Recommendations

- Tailor water conservation plans to individual utilities during the CUP process.
- Utilities should determine the effectiveness of various mandatory water conservation measures.
- Incorporate an irrigation efficiency test in the CUP Program or fund mobile irrigation labs for both urban and agricultural applications.
- The District, in cooperation with utilities and other water management districts, should promote and participate in public education campaigns on the methods and benefits of urban water conservation techniques, including utility rate structures.
- Investigate the potential for developing urban water conservation tie-ins between the CUP process and the environmental resource permitting (ERP) surface water permitting process.
- Coordinate with SJRWMD on regional conservation plans.
- Look into water conservation incentive programs.

Agricultural Conservation

The advisory committee ranked agricultural conservation low in addressing the four water resource issues for the Orlando metropolitan area. Agricultural acreage in the upper basin of the KB Planning Area is declining, while it is projected to increase in the lower basin. Therefore, the committee agreed that this option would be more effective in the Lake Istokpoga-Indian Prairie Basin. **Table 17** provides a summary of the characteristics of this option.

Table 17. Characteristics of Agricultural Conservation Option.

Cost	Capital costs for retrofit high (e.g., micro irrigation piping) Maintenance costs higher for micro irrigation, some cost deferral through agricultural support programs
Feasibility	Thought of as a long-term solution with immediate reduction of water use
Implementing Agency	IFAS, land owner, DACS, NRCS cost-share programs, water management districts
Permitability	Easy (water shortage benefits)
Quality	Most efficient systems (micro) require higher quality water
Quantity	Potential reduction in demands depending on crop type Estimated Additional Quantity Made Available by 2005: Unknown
Constraints	Crop specific/dependent (feasibility) Lack of research on more efficient systems Cost/benefit ratio for irrigation system - related to competition and economics
Other	Source of water: Free-market partnership between businesses and agriculture Many crops have already transitioned
Summary	More efficient irrigation method can play a significant role in water use reduction, but its implementation is crop specific. Due to the low margin on certain crop types, the installation of more efficient irrigation methods must be carefully reviewed This option is more applicable to the Lake Istokpoga area section of this plan

Recommendations

There are no recommendations appropriate for the Orange-Osceola County Area.

Surficial Aquifer

The advisory committee ranked the surficial aquifer low in addressing the four water resource issues for the Orange-Osceola County Area. The surficial aquifer is considered a local source of water, lending itself to local implementation. As a result, no

regional issues or recommendations were identified. **Table 18** provides a summary of the characteristics of this option.

Table 18. Characteristics of the Surficial Aquifer Option.

Cost	Inexpensive in the northern portion of the basin (\$1,000-\$3,000); more expensive in the southern portion of the basin where the aquifer deepens (\$5,000-\$20,000) Pumping cost can be higher for larger wells due to low production of wells
Feasibility	Low yield - often less than 10 GPM in northern basin
Implementing Agency	User, WMD
Permitability	Relatively easy
Quality	Poor
Quantity	Low yields Small percentage of overall demands Estimated Additional Quantity Made Available by 2005: Unknown
Constraints	Environmental impacts and aquifer productivity is low
Other	---
Summary	This is generally a source limited to small demands to the low production of wells - additional production in southern basin

Recommendations

- Promote the use of the surficial aquifer on individual projects.

Brackish Ground Water

The advisory committee ranked brackish ground water low in addressing wetland vulnerability and spring discharges, and not applicable to saline water movement or sinkhole formation. Issues that make brackish ground water a less viable alternative include treatment costs and permitting hurdles associated with concentrate disposal. In addition, transport costs associated with the piping of water from location outside of the basin where the easiest access to brackish water occurs make this option less desirable. However, as costs of membrane technologies decline, brackish water may become a more viable source in the future. **Table 19** provides a summary of the characteristics of this option, followed by recommendations.

Table 19. Characteristics of the Brackish Ground Water Option.

Cost	Relatively high Costs declining - \$2 per 1,000 (desal) - \$4-5
Feasibility	Long-term solution, supplies of saline water virtually untapped
Implementing Agency	Utilities, WMD/DEP
Permitability	Reject disposal - difficult Supply - more simple
Quality	Requires treatment
Quantity	Potentially large Estimated Additional Quantity Made Available by 2005: Unknown
Constraints	Distribution systems - additional cost centralized system Large customer base needed to support costs
Other	Majority of highly productive (quantity) saline producing areas are located outside of the planning area
Summary	RO production of saline water may provide a supplement to the overall water demand of the future, however, its higher production costs and location outside the planning basin limit its usefulness

Recommendations

There are no recommendations appropriate for the Orange-Osceola County Area.

Floridan Aquifer

The Floridan aquifer was ranked by the advisory committee as low in addressing the four water resource issues identified for Central Florida. Although it will likely continue to be the primary source of water in the immediate future, the planning analysis shows that some concern is warranted over the 20-year planning horizon. The analysis shows that the areas of greatest proposed withdrawal are in areas identified as having the highest risk for harm the resources. However, additional factors that may influence the extent of harm caused to the resources should be considered before a final determination is made. The analysis defined areas where withdrawals place the users at higher risk of contributing to harm to wetland and sinkhole formation. This harm may also extend into areas located outside the SFWMD boundaries to contribute to reductions in spring flows and saline water movement. The identification of these higher risk areas indicates that concerns of future viability of the Floridan aquifer may be warranted. However, their identification does not imply that impacts to these resources will definitely occur. Instead the analyses are intended to provide guidance on the possible risks that may result from future ground water withdrawals and to identify where future research efforts should be focused. **Table 20** provides a summary of the characteristics of this option.

Use of the Floridan was also studied by the St. Johns River Water Management District (SJRWMD) for their regional water supply planning efforts in the metropolitan Orlando area. A document entitled the "Work Group Area I - Central Florida Conceptual Water Supply Plan" was published as part of this study. SJRWMD also projects potential

Table 20. Characteristics of the Floridan Aquifer Option.

Cost	Relatively low for PWS and other urban uses Higher costs than surface water for agriculture
Feasibility	Continued short-term use appears feasible in the metro area, however, long-term continued use in the central/western Orange County area is not recommended
Implementing Agency	Utilities, private land owners, and respective WMDs
Permitability	Location of saline water, wetlands impacts, impacts to springs, and lake levels make long-term use less permitable
Quality	Excellent in most location not directly adjacent to saltwater
Quantity	Appears adequate for the immediate future; 20-year planning horizon shows possible use limitations in the central/western portions of Orange County Estimated Additional Quantity Made Available by 2005: Further analysis recommended to determine amount
Constraints	Water quality Wetland impacts Spring discharge Lake levels
Other	---
Summary	Use of the Floridan aquifer has been the primary source of water for urban and agricultural uses in the planning basin. Additional uses of the Floridan aquifer in Okeechobee, Highlands, and Glades counties appear to be acceptable within the planning horizon. However, future use of the Floridan aquifer in the central/western portion of Orange County area is limited.

harm to wetlands associated with continued use of the Floridan aquifer to meet 2020 demands. SFWMD and SJRWMD have coordinated closely on the preparation of their respective regional water supply plans.

In order to investigate continued use of the Floridan aquifer, the committee recommended that the two water management districts continue to coordinate the development of a regional analytic ground water modeling tool and hydrologic investigations. The desired outcome is to have one single, shared and publicly available tool to analyze future water demands on the aquifers, including the surficial aquifer. The water management districts should also continue to consult each other in the review of permits in the CUP process that may have cross-district impacts.

Recommendations

- Preserve, encourage and optimize recharge of the aquifer in recharge areas such as ridge and sand hill areas.
- Prioritize land acquisition in high recharge areas and look for funding from Florida Forever funding.

- Determine/quantify maximum sustainable yield to better manage resources. Long-term studies with 50-70 year horizons are suggested.
- Support shared model development between the water management districts and local users to more accurately cumulative impacts.
- Water management districts should facilitate cooperative, regional solutions for utilities and local governments.
- The District should not issue 20-year duration permits for additional uses until such time as the other recommendations of this plan are in place and the estimates of available Floridan aquifer yield for Central Florida is resolved satisfactorily. However, the advisory committee recommends issuance of 20-year permits for existing uses.
- The District, in partnerships with the SJR and SWF water management districts, USGS and local governments, should continue existing studies and begin appropriate new studies to more accurately access the hydrologic and geologic factors involved in estimating the results of ground water withdrawals on the natural systems in Central Florida.
- Water management districts should work together to evaluate consistent resource protection criteria.

Please refer to the Related Strategies section for further details regarding coordination, permitting, and research.

Lake Istokpoga-Indian Prairie Basin

A critical part of the KB Water Supply Plan is evaluation of the water use problems of the Lake Istokpoga-Indian Prairie Basin (Istokpoga Basin) and identification of alternate supply options where deemed necessary. An evaluation of the current and projected ground water use for this basin showed that an adequate supply existed; therefore alternative sources need not be identified. Historically, the use of additional surface water from Lake Istokpoga has been restricted as a result of several water shortages that occurred in the area. Agricultural areas within the Istokpoga Basin, south of Lake Istokpoga, are dependent upon the lake as the primary irrigation supply.

In order to address the surface water deficits more fully, the advisory committee formed a subcommittee or focus group. This group identified the issues to address within the Istokpoga Basin and reviewed the analysis developed to address these concerns. The group also identified and discussed several water resource options that would address the projected shortfalls in water supply specific to the Istokpoga Basin. The options discussed looked at either making additional water available or reducing projected demand. The options discussed were broken down in two groups, as shown in **Table 21**.

Table 21. Water Source Options Identified by the Advisory Committee for the Lake Istokpoga-Indian Prairie Basin.

Group A^a	Group B^b
Lake Okeechobee backpumping	Increase irrigation efficiency
Water from the Kissimmee River at S-84	Regulation schedule/minimum operational level on Lake Istokpoga
Changes for minimum operational flows	Removal of tussocks from Lake Istokpoga
Increase use of Lake Istokpoga	Water from Kissimmee at G-85
Regional Reservoirs	Increasing flows to Lake Istokpoga
	Additional ground water
	Aquifer storage and recovery
	Surficial Aquifer System
	Local reservoirs
	Increase canal storage

- a. Group A options: alternatives with the most potential for development of significant additional supplies or would work to reduce the projected demand deficits.
- b. Group B options: alternatives with limited potential for development of significant additional supplies or reduction of projected demands.

All of the options were discussed at length with the focus group and brought back to the full committee for development of the recommendations. Development of each of these options could have regional, as well as local responsibilities. The focus group divided the options into two groups. Group A are those alternatives that showed the most potential for development of significant additional supplies or would work to reduce the projected demand deficits found within the Istokpoga Basin. Those options in Group B are expected to yield limited additional supply or reduction of projected demands. The following discussion does not reflect an order of importance or ranking among the options.

Lake Okeechobee Backpumping

The Water Rights Compact, described in Chapter 5 of the Support Document, created the Seminole Tribe's entitlement to a certain percentage of surface water in this planning basin. Agreement #C-4121, between the District and Tribe creates an operational scheme for delivery of the Tribe's water entitlement rights to the Brighton Reservation. The source of surface water supplies to the Brighton Reservation varies and is primarily dependent upon water shortage conditions and canal levels. Ultimately, this Agreement reserves specific quantities of Lake Okeechobee water for the Brighton Reservation, if water shortage restrictions exist and optimum canal levels are not maintained. In order to meet the Tribe's water entitlement, two pumps (G-207 and G-208) were installed in the early 1990s adjacent to water control structures S-71 and S-72. These pumps function to move water from Lake Okeechobee around the respective structures to the lower pools of the C-40 and C-41 canals which run through the Brighton Reservation. At this time, water

delivered by these pumps can only be accessed by activities having access to the canals below the S-70 and S-75 structures.

Since the installation of G-207 and G-208, records show that the pumps have not been used to their full capacity of 60,000 GPM each. This option evaluates utilizing these pumps in an increased manner. Under this option, the pumps would be identified as the primary source of water to meet the demands for users having access to the C-40 and C-41 canals below the S-70 and S-75 structures. This would allow water currently supplied from Lake Istokpoga to meet the demands originating below the S-70 and S-75 structures to be redirected to other areas within the basin.

During the discussion of this item, the focus group raised several concerns that need to be resolved in order to enact this option. Among these concerns were the existing water quality of Lake Okeechobee water, the cost of pump operation and competition with Lake Okeechobee water resources.

Water Quality

The quality of water in Lake Okeechobee was the most significant concern raised by the focus group. The concern relates to current efforts on the part of the USEPA, FDEP, and SFWMD to set water quality discharge standards to Lake Okeechobee. Discharge concentration levels to the lake for several water quality parameters are expected to be developed over the next several months, with the implementation strategies to be developed over the following year. The discharge standard for phosphorus is expected to be about 40 ppb. The focus group expressed concerns over meeting this standard if the area accepts water from Lake Okeechobee, which is currently experiencing levels that range between 40 and 180 ppb total phosphorus.

Competition for Water Resources from Lake Okeechobee

Lake Okeechobee performs a wide variety of functions, which make its management complex. The lake is a water supply source for substantial environmental needs including the Caloosahatchee and St. Lucie estuaries, the Loxahatchee National Wildlife Refuge, the Water Conservation Areas, the Everglades National Park, Biscayne Bay, and Florida Bay. The lake also provides water for agricultural and human demands. An evaluation of the entire Lake Istokpoga-Indian Prairie Basin demands was not assessed for a number of reasons. First, the entire basin has not, historically, relied upon Lake Okeechobee for water supply. In fact, Lake Istokpoga has served as the entire region's primary water supply.

Given the expectations placed on Lake Okeechobee and concerns for its ability to sustain these functions, the District, as well as other state and federal agencies, have undertaken many studies related to Lake Okeechobee's water supply and quality. The Lower East Coast Water Supply Plan, the Comprehensive Everglades Restoration Plan, the Total Maximum Daily Load effort, and the Okeechobee SWIM Plan are examples of the various projects which are underway and address Lake Okeechobee issues.

Appreciation for the lake's various functions yields an understanding of its appropriate role in supplying the future water needs for the Lake Istokpoga-Indian Prairie Basin.

Costs

Pumps G-207 and G-208 have been in operation since the early 1990s. During that time the operational costs associated with the pump operation have been monitored. The operational costs are broken down into pump operation, machinery maintenance and facility maintenance. Although the total cost of operation varies slightly between the two pumps and from year to year, the average cost of operation is estimated to be between \$60 and \$65 per hour of use for each pump. Results of the analysis described in Chapter 4 indicate that the use of pumps G-207 and G-208 is estimated at 2,142 hours of operation during the 1-in-10 drought condition. Using this estimate of hours of operation, the cost of the pump operation is estimated at \$128,590 annually.

Issues

- Water quality from Lake Okeechobee is still an unknown but is higher than the anticipated TMDL.
- Landowners asked to use water may raise concerns over future water quality discharge requirements.
- Competition for Lake Okeechobee resources.
- Cost of the operation of the pumps.
- Operational agreements with individual landowners and the Seminole Tribe.

Recommendations

- District needs to assist in finalizing the concentration standards to be set on Lake Okeechobee.
- The District should work with the Tribe to assure that the changes in water source do not cause undue regulatory burden.

Water from the Kissimmee River at S-84

This option, like the option above, evaluates additional use of water from Lake Okeechobee. The option focuses on withdrawing additional water from the Kissimmee River near the S-84 Structure (via adding a new pump) located on the C-41A Canal. The connection of the C-41A Canal and the Kissimmee River lies below the S-65E Structure. Pool E of the Kissimmee River is in direct connection with Lake Okeechobee and is effectively removing water from Lake Okeechobee. Water quality and competition issues associated with this source are the same as those for the direct use of Lake Okeechobee listed in the first option.

A component of this option also evaluates the addition of a new pump at the S-83 Structure to move water around this structure into the uppermost reach of the canal

system. Two pumps (one at S-84 and one at S-83) working in coordination, would allow water to be moved to the uppermost reaches of the system for distribution to other areas within the basin. The construction of two pumps will provide additional reliability to the delivery system that supplies water from Lake Okeechobee to this basin via the existing pumps G-207 and G-208. This option has additional benefits of acting as a source of water to replace lost water supply from Lake Istokpoga during lake restoration efforts currently proposed by the Florida Wildlife Commission (FWC).

A variation on this supply option discussed at the focus group meetings was to divert water to the C-41A Canal above the S-65E Structure, thereby removing water from the Pool D of the Kissimmee River. This option was discussed as a means to avoid the withdrawal point being located within the currently designated Lake Okeechobee service area. This would require engineering improvements to existing culverts and structures between the river and the canal. Water quality in Pool D has been determined to be some of the worst entering Lake Okeechobee, due in part to upstream dairy farms located in this area. For this reason, this option was given less consideration than removing water below the S-65E Structure.

Costs

Implementation of delivering water to the Istokpoga Basin under this option will require the installation of two new pumps and small modifications to the existing control structures at S-84 and S-83. These structures are currently proposed for construction improvements in the next year. If the design modifications required for the installation of pumps at these structures can be incorporated into the new structure design, costs of the S-84 and S-83 structure modifications can be minimized. The estimated cost of design, construction, and operation of these two pumps are provided in **Table 22**.

Table 22. Total Estimated Pump Costs.^a

Pump Type	Engineering/ Design Cost	Construction Cost	Operation and Maintenance
Electric	\$50,000	\$3-4 million	\$120,000 per year
Diesel	\$50,000	\$1.5-3 million	\$80,000 per year

a. Based on 2,000 hours of operation per year.

Source: SFWMD.

Using the known operating costs of electric pumps G-207 and G-208 as a guide, the cost of operation and maintenance for electric pumps is estimated at \$60 per hour. Discussions among the focus group suggested that diesel pumps might be less expensive to construct and operate. Estimates of operation and maintenance costs for diesel pumps were estimated to be about \$40 per hour.

Issues

- Requires construction of new pumping facility to move water around the S-84 Structure.

- Cost of operation and maintenance.
- Utilization of pumps G-207 and G-208 in conjunction with additional supplies from Lake Istokpoga may not make the pumps at S-84 and S-83 necessary.
- Installation of pumps at S-84 and S-83 will provide better assurances to those farms withdrawing water from the C-41A Canal between structures S-83 and S-84.
- This option takes on additional importance if the Lake Istokpoga drawdown occurs.
- Competition for Lake Okeechobee resources.
- Water quality of Lake Okeechobee.

Recommendations

- The District should review the plans for modification of structures S-83 and S-84 prior to construction to determine if the necessary improvements for water supply could be incorporated.
- The District should assist in finalizing the concentration standards to be set on Lake Okeechobee.

Increase Use of Lake Istokpoga

This option evaluates obtaining additional water from storage held in Lake Istokpoga above its current minimum operational level. This is a no-cost option that makes additional water available immediately. Studies completed as part of this planning effort estimated that the use of additional storage might resolve a large portion of the projected deficit. Water quality from the lake is currently meeting the target goals for the Lake Okeechobee SWIM Program.

This option received the largest amount of debate from the focus group. Concerns were raised as to what the proper regulation schedule and the minimum operation levels for the lake should be. Some members of the committee thought that the existing level of 37.5 feet was too low due to navigational issues. Others thought that the lake did not fluctuate enough and should be allowed to drop to 36.5 feet on occasion. Concerns were also expressed about the timing of the year at which these levels should be achieved. Everyone agreed that maximizing the annual fluctuation of water levels on the lake while maintaining navigation and flood protection constraints would be a benefit.

Recommendations published in an April 1999 report on the Central and South Florida Comprehensive Review Study (Restudy) contain a proposed project to study the current regulation schedule for Lake Istokpoga. The project is part of the long-term comprehensive management plan anticipated to enhance fish and wildlife in South Florida. This project specifically reviews the lake fluctuation pattern with regards to balancing environmental habitat, flood protection, and water supply issues. Funding for this project has been authorized as part of the federally authorized Water Resources

Development Act and assumes a 50/50 cost share on the part of the District. This component of the comprehensive plan is expected to begin in year 2000 with completion of the review during 2001.

Costs

There is only minimal cost to utilize water in storage from Lake Istokpoga. Costs associated with a review of the regulation schedule are estimated to be \$84,000 under the Restudy, with the federal government and the District having a 50/50 cost share.

Issues

- The minimum operational level for Lake Istokpoga, including the low water stage and duration.
- Conflicting management objectives for Lake Istokpoga.
- The Restudy has proposed to evaluate the Lake Istokpoga regulation schedule.
- The need to establish a MFL for this lake may effect the long-term availability of water.

Recommendations

- District should review existing minimum operational level for Lake Istokpoga.
- District should incorporate the issues of the 2020 water supply demands into the review of the Lake Istokpoga regulation schedule proposed by the Restudy.
- District should initiate a review of the impact of long-term lower water levels in Lake Istokpoga and the effects this may have on lakes along the Lake Wales Ridge.

Local Reservoirs

This option considers the use of reservoirs used by individual farms for storage of recycled irrigation water or the collection of local storm water runoff. These local reservoirs are also useful in providing water quality treatment before off-site discharge.

Concern was expressed by the focus group over the conflicting goals used to regulate construction and use of these local reservoirs. In many cases, wetland environments are preserved in the reservoirs. District regulations appear to have competing issues in protecting the environment, while maximizing use of these reservoirs as a water supply source.

Costs

The estimated costs associated with local reservoirs are provided in **Table 23**.

Table 23. Local Reservoir Estimated Costs (\$/Acre).

Reservoir Type	Construction Cost	Engineering/ Design Cost	Administrative Cost	Land Cost	Operations and Maintenance Cost
Minor Reservoir	2,850	400	320	5,500	120

Source: SFWMD.

Issues

- Cost of construction, operations and maintenance to individual farmers.
- Use of reservoir will help in meeting off-site water quality discharge requirements as well as help attenuate volume of discharges

Recommendations

- The District should encourage construction of multi-purpose reservoirs, which include a water supply benefit.

Regional Reservoirs

This option considers a possible large regional water storage facility. The benefits of this type of facility include storm water attenuation, water quality treatment and dry season storage. The location of such a reservoir could be north or south of Lake Istokpoga, although the maximum benefit for water quality treatment could be achieved south of the lake. The analysis completed as part of this plan suggests that the amount of water that might be stored in a regional reservoir may be limited during a 1-in-10 drought. These modeling efforts show monthly demands for water from Lake Istokpoga in excess of the supply for all months except for August. The focus group also pointed out the water quality treatment benefits of a large reservoir and the pending water quality discharge requirements being set for Lake Okeechobee.

Recommendations published in an April 1999 report on the Central and South Florida Comprehensive Review Study (Restudy) call for the construction of a storage reservoir to be located north of Lake Okeechobee within the KB Planning Area. The total storage capacity of the reservoir is estimated to be 200,000 acre-feet. No specific location has been identified, although the location is projected for Glades, Highlands, or Okeechobee counties. Initial design for the reservoir is 17,000 acres in size with a 2,500 acre treatment area. Final designs will be based on sight selection and evaluation. The purpose of the reservoir is to attenuate water discharges and reduce nutrient loading to Lake Okeechobee and the Kissimmee River. Funding for this project is expected to be proposed for future federally authorized Water Resources Development acts after the year 2010. This component of the comprehensive plan is projected to begin in year 2011 with

completion before 2015. Funding for this comprehensive plan component is estimated at \$285 million.

Costs

The cost of reservoir construction and operation/maintenance is the major deterrent to reservoir use. In particular, land costs will be higher than normal for a reservoir in this region since land areas suited for the location of a reservoir are most likely lands currently in agricultural production. **Table 24** summarizes the estimated cost components associated with constructing and operating a regional reservoir.

Table 24. Regional Reservoir Estimated Costs (\$/Acre).

Reservoir Type	Construction Cost	Engineering/ Design Cost	Administration Cost	Land Cost	Operations and Maintenance Cost
Major Reservoir	7,980	900	450	5,500	105

Source: SFWMD.

Issues

- Expensive construction and maintenance.
- Water balance on use versus storage shows limited volume of water during a 1-in-10 drought.
- Water quality control component for increasing agricultural activities and meeting future.
- Lake Okeechobee discharge requirements.
- Allow more flexibility on operation levels for Lake Istokpoga.
- Restudy is looking at a possible reservoir location.

Recommendations

- District should prioritize the construction of a regional reservoir in the Istokpoga Basin that has been identified in the Restudy.
- District should undertake an effort to evaluate the effectiveness of a reservoir located in the Istokpoga Basin toward meeting future water demand and water quality improvements.

Changes for Minimum Operational Flows

This option considers the relaxation of the minimum operational flow requirements set in the District's Water Shortage Rule, 40E-22, F.A.C., that establish prescribed total monthly minimum flows through the lower structures S-71, S-72, S-84, S-127, S-129, and S-131, with the bulk of the flow coming from the first three structures.

This option looks to reduce the projected deficit by reducing the required amounts to be discharged from the Istokpoga Basin. These discharge amounts vary each month, with winter and spring having the lowest requirements. The annual total discharge required is 37,740 acre/feet. The discharge requirements were initially established based upon the findings of a 1974 report (Storch, et. al, 1974) which looked at structure integrity and water quality components of the canal systems.

The potential impact on the reduction of the demand deficit is expected to be limited. Although the total annual reduction is significant at 37,740 acre/feet, the reduction on the deficit in the spring and winter is often less than 1,000 acre/feet each month. The cost of this option is anticipated to be small with completion of a study to evaluate lower flow requirements as a basis for future rulemaking efforts. Such a study might dovetail well as a component of the Restudy evaluation of the Lake Istokpoga regulation schedule.

Issues

- This option supplies only minimal additional flexibility during the spring and winter months when the shortfall is greatest; the bulk of the supply becomes available in the summer.
- This option will take some time to implement, as it will require a rule change.
- Research is needed to examine and consider revising current minimum operational flows.

Recommendations

- The District should complete a study to re-evaluate the required minimum operational flows through the lower basin structures.
- Pending the results of the study, the District should initiate rulemaking efforts to modify Chapter 40E-22, F.A.C., to incorporate the revised flows.

Increased Irrigation Efficiency

This option evaluates reducing irrigation requirements as one method of decreasing future demands. Since a bulk of the additional surface water use in this basin is proposed for crop types that have historically used lower efficiency irrigation methods such as seepage, there is a potential for substantial water reductions. The major concern raised by the focus group was that the more efficient methods of irrigation have little or no track record proving the viability or economic variables associated with the alternate method. Local farmers raised concerns that the margin on sugarcane and other crop types projected for this area may be too small to allow for the use of other sources of water such as ground water. Other replacement crops could be grown such as citrus to reduce the overall demand projections.

Issues

- Lower efficiency methods may increase the amount of off-site discharges.
- Alternative methods of irrigation are possible, but do not have a long-track record.

Recommendations

- Prepare a pilot study reviewing alternate means of irrigation.

Water from the Kissimmee River at G-85

This option looks to withdraw water from the Kissimmee River using the Istokpoga Canal. A gate structure/pump is proposed for installation adjacent to the G-85 Structure. Water would then be diverted south along existing canals located on the Lykes Brothers, Inc. property to the C-41 Canal just downstream from the S-68 control structure. From this location, water could be distributed to other users in the basin using the existing operation/management guidelines. The G-85 Structure is currently scheduled for replacement within the next year.

The access point of the Istokpoga Canal with the Kissimmee River is in the area currently being restored. The Kissimmee River Restoration Project is a \$448 million project to restore the ecosystem, flood attenuation and water quality treatment characteristics to channeled sections of the river. Construction of the project started in June 1999. The success of the restoration effort has been tied to specified target goals based upon anticipated flows within the Kissimmee River and its tributaries. Studies completed as part of the restoration effort indicate that during certain months there may be insufficient water to meet all of the targeted restoration goals. This suggests that seeking water from the restored section of the Kissimmee River may worsen chances of achieving the specified targets.

Water quality from this portion of Kissimmee River is good. The diversion point is located north of the dairies and other known contamination sources. Water quality is expected to improve as the river restoration effort moves forward.

Costs

The estimated costs associated with this option are in **Table 25**.

Table 25. Istokpoga Canal Diversion Estimated Costs (dollars).

Engineering/ Design Cost	Construction of Culvert/ Pump Cost	Canal Improvements Cost	Land/Lease Cost	Operations & Maintenance Cost
60,000	---	---	---	---

Source: SFWMD.

Issues

- This option would allow water to be placed near the top of Indian Prairie Canal system for downstream distribution.
- G-85 is proposed for replacement, which would minimize the costs of this option.
- Landowner agreements needed to address transport of water from the Istokpoga Canal to other canals or Lake Istokpoga.
- Concerns over Kissimmee River Restoration effort. The restoration effort has identified the need for additional water beyond the current surface water flows to the river to meet restoration goals.
- Water quality is good from this portion of Kissimmee River.

Recommendations

- Re-evaluate the restoration effort to identify water available from the Kissimmee River.

Additional Ground Water

Ground water is used extensively in the Lake Istokpoga-Indian Prairie Basin as a source for citrus and other crops. Based upon the modeling analysis completed as part of this planning effort, there appears to be ample ground water within this basin. Water wells installed in this area yield good quantities of water. Concentrations of sulfur appear to be high, but not prohibitive for agricultural activities. Wells located south of the Glades-Highlands County line show elevated concentrations of chlorides, worsening further south.

The financial margin on the crop types proposed for new production, particularly sugarcane, is stated to be small. The focus group indicated that the operations and maintenance costs associated with the use of ground water for these low margin crops would make growing such crops economically questionable.

Costs

The estimated costs associated with this option are presented in **Table 26**.

Table 26. Estimated Well Costs for the Floridan Aquifer System^a.

Floridan Aquifer System	Drilling Cost (per well)	Equipment Cost (per well)	Engineering Cost (per well)	Operations and Maintenance Costs (per 1,000 gallons)
Costs	\$92,000	\$52,000	\$14,000	\$.062

a. Costs based on a 16-inch diameter well and a depth of 900 feet.

Source: PBS&J, 1991, Water Supply Cost Estimates.

Issues

- According to the farmers, the operations and maintenance cost on the well operation is prohibitive to growing certain types of the projected crops due to the small margin of profit. These crops include sugarcane, pasture, sod, and some field crops.
- Back up supply potential.

Recommendations

There are no recommendations appropriate for the Lake Istokpoga-Indian Prairie Basin.

Removal of Tussocks from Lake Istokpoga

This option looks at the water supply benefits associated with the proposed lake drawdown and restoration of Lake Istokpoga. This option was considered for two benefits; the increase in additional storage as a result of the removal of materials, and as a maintenance consideration to maintain the existing storage in the lake. The additional storage expected from the restoration efforts is approximately 4,000 acre/feet, a relatively small amount. The costs for the project have not been completely determined. However, initial estimates suggest the total cost will be about \$6-8 million. Cost sharing with the Florida Wildlife Commission and other agencies is possible.

Issues

- Expected to yield about 4,000 acre/feet per year of addition storage for use.
- Possible merit for the long-term maintenance of storage from the lake.
- Expensive solution solely as a water supply option.
- Restoration work will help maintain water volumes in lake and prevent possible gate structure releases.

Recommendations

There are no recommendations appropriate for the Lake Istokpoga-Indian Prairie Basin.

Regulation Schedule/Minimum Operational Level on Lake Istokpoga

This option has the potential of delivering substantial amounts of additional water to the basin if the schedule is changed to promote additional storage or the minimum operational levels are changed. This was not evaluated under this planning effort, as the Restudy project has proposed to address this issue starting in 2001. Both of these factors could significantly alter the availability of water as determined under this study.

Recommendations

- The District should establish a minimum level in accordance with Chapter 373, F.S. for Lake Istokpoga no later than 2003.
- The District should incorporate the issues of the 2020 water supply demands into the review of the Lake Istokpoga regulation schedule proposed by the Restudy.

Increasing Flows to Lake Istokpoga

This option looks at this possibility of increasing water flowing into Lake Istokpoga from its tributaries of Josephine and Arbuckle creeks. The headwater for each of these creeks is located outside the District boundaries, within the SWFWMD. USGS measuring devices are located on both of these creeks and the District's water shortage rule has specified minimum flow requirements for each of these measuring stations. Concerns were raised by the focus group about the competing use of these creeks.

Issues

- Competition for resources with the SWFWMD lake restoration efforts.
- Need to assure other restoration efforts do not reduce flows to Lake Istokpoga.

Recommendations

- The water management districts should work together to look at the issue of water inflows to Lake Istokpoga.

Aquifer Storage and Recovery

Aquifer storage and recovery (ASR) is the underground storage of injected water into an acceptable aquifer (typically the Floridan aquifer in South Florida) during times when water is available, and the subsequent recovery of this water when it is needed. In this operation, the aquifer acts as an underground reservoir for the injected water. Current regulations require injected water to meet primary drinking water standards when the receiving aquifer is classified as an underground source of drinking water (USDW) aquifer, unless an aquifer exemption is obtained.

The focus group discussed the application of this technology in the Lake Istokpoga-Indian Prairie Basin utilizing water that might be released from Lake Istokpoga for flood control. Water captured from the lake would require some treatment to meet primary drinking water standards prior to injection, or require that an aquifer exemption from the U.S. Environmental Protection Agency (USEPA) would have to be obtained. Obtaining an aquifer exemption is a difficult process with few approved. Currently, there are no operating, untreated surface water ASR projects in Florida although SFWMD was

granted a limited aquifer exemption to inject untreated surface water for the ASR Demonstration Project for Lake Okeechobee.

The original purpose of the ASR Demonstration Project for Lake Okeechobee was to determine the role of ASR technology in diverting nutrients from Lake Okeechobee, with diversion of water from the Taylor Creek/Nubbin Slough Basin. Other goals that were developed as the project progressed were to: determine the physical ability of storing large volumes of surface water; the effects of storage on the water quality, including bacterial survival; and recovery efficiency. The results of the study indicate large volumes of surface water could be stored through ASR wells, beneficial changes in water quality could occur (especially phosphorus), fecal coliform could be eliminated by storage in the Floridan aquifer, and high permeability zones reduce the recovery efficiency in ASR wells. The project concluded in 1989 and the well has not been used since. The decision whether to reactivate this well is currently being considered in a Restudy component called the "Lake Okeechobee ASR Pilot Project." It is anticipated that the evaluation and decision to reactivate this well will begin in FY 2001.

Costs

Estimated costs for an ASR system largely depend on whether the system requires pressurized pumping equipment. As shown in **Table 27**, one system uses pressurized water from a utility; whereas the second ASR system uses unpressurized treated water, thus requiring pumping equipment as part of the system cost. The latter system with its associated pumping costs is more indicative of an ASR system in combination with surface water storage. There will also be additional costs for screening and filtering untreated surface water, as well as other required treatment.

Table 27. Aquifer Storage and Recovery System Estimated Costs^a.

System	Well Drilling Cost (Per Well)	Equipment Cost (Per Well)	Engineering Cost (Per Well)	Operation and Maintenance Cost (per 1,000 gallons)	Energy Cost (per 1,000 gallons)
Treated Water at System Pressure	\$200,000	\$30,000	\$360,000	\$.004	\$.06
Treated Water Requiring Pumping	\$200,000	\$100,000	\$400,000	\$.006	\$.06

a. Costs based on a 900-foot, 16-inch well, with two monitoring wells using treated water.

Source: PBS&J, 1991, Water Supply Cost Estimates.

Water Quantity

The volume of water that could be made available through ASR wells depends upon several local factors, such as well yield, water availability, variability in water supply, and variability in demand. Typical storage volumes for individual wells range from 10 to 500 million gallons (31 to 1,535 acre-feet), (Pyne, 1995). Where appropriate, multiple ASR wells could be operated as a wellfield, with the capacity determined from the recharge and/or recovery periods. The storage time is usually seasonal, but can also be diurnal, long term or for emergencies.

Issues

- Due to the expense associated with construction, this option is unlikely to be implemented solely on the water source needs of the Lake Istokpoga-Indian Prairie Basin.
- Research is needed to assist in permitting this technology.

Recommendations

- The District should evaluate the potential of co-locating ASR and surface water storage to supplement storage or enhance water supply, if required and cost effective.
- The District will support the Restudy component to evaluate the potential of reactivating the District ASR Demonstration Project for Lake Okeechobee.
- The District will look at the potential of a public/private partnership with the Lake Okeechobee ASR projects.
- The District will continue working with the USEPA and FDEP to explore rule changes to the federal and state underground injection control program to allow for (and encourage) injection of untreated surface water and ground water with ASR.

Surficial Aquifer System

This option considers the surficial aquifer as a source of water through shallow wells. This option was given a lower ranking as a regional source due to the low production rates of wells and the generally high iron content of water. The aquifer may have some application to local uses such as cattle watering or residential use. There may also be some applicability of the shallow aquifer through the use of horizontal wells. These type wells, however, have a higher risk of effecting environmentally sensitive areas because they use water from the same aquifer as wetlands. Use of horizontal wells should be reviewed on a case-by-case basis.

Recommendations

There are no recommendations appropriate for the Lake Istokpoga-Indian Prairie Basin.

Increased Canal Storage

This option considers adding storage in the basin. This option was given a lower ranking because it is not expected to yield a large amount of additional storage with current right-of way areas.

Recommendations

There are no recommendations appropriate for the Lake Istokpoga-Indian Prairie Basin.

SUMMARY OF COSTS FOR WATER SOURCE OPTION DEVELOPMENT

Cost information has been provided throughout this chapter that could be used to estimate the planning-level cost for each of the water source options. This cost information is presented as a unit cost per 1,000 gallons of water to ease comparison of the identified options. In preparing these unit cost estimates, the following were considered:

- Capital costs including well drilling, construction, and equipment costs, land and engineering costs)
- Operation and maintenance costs (including energy general up-keep costs)

The unit costs are an estimate of life-cycle costs and are a function of the capital construction, a 30-year expected life of the constructed facilities, time value of money, and the annual operation and maintenance costs for the facility. The costs associated with construction and operation and maintenance of the distribution system are not included in this evaluation and can greatly change the total cost of each option.

The cost information was used to develop planning-level unit production costs for each water source option (**Table 28**). The unit production cost equals the total costs divided by water production, expressed in dollars per 1,000 gallons. For all source options, the time value of money equals 6 5/8 percent per year, consistent with discount rates used by the U. S. Army Corps of Engineers. A 30-year fixed capital asset life was assumed and an operating level of 70 percent of capacity was used. In order to arrive at the unit production costs over the twenty-year planning horizon, the unused capital value at the end of the twenty-year planning horizon (1/3 of total capital value based on straight-line depreciation) was deducted from the expenditure based costs. All costs are expressed in constant 1999 dollars.

Table 28. Summary of Unit Production Costs for Water Source Options.

Water Source Option	Water Production Range	Unit Production Costs (\$/1000 gallons) ¹
Conservation (urban indoor)	Variable	\$0.22 - \$3.70 ²
Conservation (urban outdoor)	Variable	\$0.03 - \$0.88
Irrigation System Conversion (based 25,000 citrus)	Variable	\$0.25 - \$0.35
Ground Water		
Surficial Aquifer - withdrawal only	1-2 MGD	\$.03 - \$.05
Surficial Aquifer w/chlorination/filtration	1-2 MGD	\$.83 - \$1.58
Surficial Aquifer w/membrane treatment ⁴	1-2 MGD	\$1.30 - \$3.05
Intermediate Aquifer - withdrawal only	1-2 MGD	\$.06 - \$.08
Intermediate Aquifer w/lime softening	1-2 MGD	\$.56 - \$2.96
Intermediate Aquifer w/membrane treatment ⁴	1-2 MGD	\$1.33 - \$3.08
Floridan Aquifer - chlorination only	3-20 MGD	\$.12 - \$.22
Floridan Aquifer w/ membrane treatment	3-20 MGD	\$1.23 - \$2.76
Reclaimed Water	1-5 MGD	\$.40 - \$2.20
Drainage Well (passive treatment req.)	1-5 MGD	\$0.02-\$0.06 ⁶
Storage		
Aquifer Storage & Recovery	3 - 20 MGD	\$.09 - \$.12
Surface water Reservoir (4 feet deep)	6,000 acre-feet	\$.21 ³
Surface Water Reservoir (8 feet deep)	12,000 acre-feet	\$.18 ³
Surface Water - withdrawal only	3 - 20 MGD	\$.03 - \$.21 ⁵
Surface Water w/coagulation/filtration	3 - 20 MGD	\$.90 - \$1.28 ⁵
Surface Water w/membrane treatment	3 - 20 MGD	\$.98 - \$3.20 ⁵

¹ All costs are over a 30-year project life and are not discounted. Because of economies of scale, the lower cost represents cost per unit for the greater capacity.

² Ranges for retrofit kits to toilet rebates.

³ Represents the cost based on construction and operation and maintenance. Unit cost can be highly variable depending on operational regimes.

⁴ Assumes deep well injection used for concentrate disposal.

⁵ Assumes withdrawal from existing surface water source, such as a canal or existing surface water management system. Separate storage area not included in cost estimate.

⁶ Costs based on well construction and passive treatment system such as retention ponds and UV treatment.

For most of the water source options, general assumptions were used to generate the unit cost information. These costs can be highly variable depending on the specific situations of users, as reflected in the cost ranges for some of the options. Water supply costs vary for a number of reasons including, but not limited to the following:

1. Hydrogeologic and hydrologic conditions relating to the depth to the aquifer, the yield of the aquifer, the water availability, the degree of treatment required, etc.
2. Economies of scale in spreading fixed costs over a larger volume of output

3. Capacity utilization. In an area of slow growth a larger percentage of capacity can be utilized than in areas of more rapid growth
4. Water quality concerns. Depending upon the quality of the raw water and the nature of the end use, different levels of treatment will be needed

RELATED STRATEGIES

The advisory committee also recommended the District consider the following strategies to implement the KB Water Supply Plan. These strategies address coordination between the water management districts and consistency between planning and permitting.

Coordination Among Water Management Districts

The location and nature of the KB Planning Area warrants intensive coordination with adjacent water management districts, particularly in water resource investigation, water resource planning, water resource regulation, and water shortage declarations. To better coordinate these activities, the three water management districts have entered into a Memorandum of Understanding (MOU), which outlines guidelines for coordination in each of these four areas. In addition to the MOU, the advisory committee recommended the strategies outlined below. The committee felt that the water management districts needed to improve their coordination and communications. Among the items to coordinate between the Districts are:

- Consistent resource protection criteria
- Hydrologic investigations
- Improved hydrologic modeling
- Interdistrict transfers of water
- Local sources first
- Minimum flows and levels
- Water shortage declarations

Permitting

A major theme of the advisory committee meetings was for the St. Johns River, Southwest Florida, and South Florida water management districts to have consistent permitting criteria. These criteria include the following:

- Level of certainty
- Resource protection criteria
- Cumulative analysis

- Water shortage triggers
- Permit duration
- Minimum flows and levels
- Special Designation Area amendments, including Restricted Allocation Areas

The KB Water Supply Plan addresses various supply and demand parameters that serve to define the quantity of water that is available for allocation. These parameters are appropriate for use in the CUP Program. Additional KB Water Supply Plan parameters related to environmental and water shortage are also appropriate for rulemaking and are related to the District's overall water management program, beyond CUP Program considerations. Thus, the committee recommended for future rulemaking to considering addressing salient portions of this water supply plan into the CUP Program and other components of District's overall water supply management scheme.

Research

To advance many of the strategies, the advisory committee recommended further research on interactions among aquifers, resource protection criteria, common models, and the effects of urbanization on water budgets.

- Develop better information on:
 - amount of water available for consumptive use
 - cumulative impacts
 - resource protection criteria (e.g., wetland impacts)
 - interaction between aquifers
 - and costs of water sources and technologies
- Develop one regional ground water modeling tool to assess resource impacts of future demands
- Study urbanization effects on water budgets

Other

Other coordination efforts include potentially establishing a Water Resource Caution Area (WRCA) in Orlando and implementing a public awareness program in common planning areas of the water management districts as described in the following section.

Water Resource Caution Areas

There was much discussion in advisory committee meetings regarding the need to establish a WRCA in the SFWMD portion of the Orange-Osceola County Area. The primary benefit of this strategy is to allow participation in the District's Alternative Water Supply Funding Program. The committee asked for a discussion to clarify this strategy. During the discussion, the committee addressed potential consequences of declaring a

WRCA, especially in terms of the local source first concept and interdistrict transfers. In the end, the consensus of the committee was not to establish a WRCA designation in the Orange-Osceola County Area.

Public Awareness

The advisory committee recommended that the water management districts develop a consistent message regarding water supply problems and solutions in common planning areas. A public awareness program could be an effective vehicle to educate the public on the role of the water management districts and to open the interdistrict coordination process to the public.

Consistency Between Planning and Water Use Permitting

The strategies addressed under this section relate to consistency between planning and water use permitting within the SFWMD. In order for effective transition from the planning stage to the implementation stage, through the CUP Program, several matters must be addressed to fully integrate the plan's forecast with permit criteria.

Restricted Allocation Areas

Restricted allocation areas are District designated areas where the water resources are managed in response to specific surface water and ground water sources for which there is a lack of water availability to meet the needs of the region. Surface water in the Istokpoga Basin is the only restricted allocation in the KB Planning Area.

The advisory committee recommends that the District evaluate lifting the moratorium on new surface water allocations from the Istokpoga Basin-Indian Prairie Basin as part of the water use rulemaking process. This issue received a great deal of debate in the committee with certain interests expressing a desire to a reduced dependence on Lake Istokpoga. The consensus of the committee was that Lake Istokpoga should be the last option for additional supplies. The committee further recommended that any further allocations be contingent upon implementation of the other identified water source options.

Permit Duration

House Bill 715 amended Section 373.236, Duration of Permits. The new statute provides that:

Permits shall be granted for a period of 20 years, if requested for that period of time, if there is sufficient data to provide reasonable assurance that the conditions for permit issuance will be met for the duration of the permit; otherwise permits may be issued for shorter durations which reflect the period for which such reasonable assurances can be provided.

The advisory committee recommends that the District evaluate requests for 20-year permits for consistency with the KB Water Supply Plan. The committee felt that additional research on the aquifer systems in the KB Planning Area is necessary before issuing long-term permits for additional water.

Minimum Flows and Levels for Priority Water Bodies

In addition to water resource and water supply development strategies, Chapter 373, F.S. requires the water management districts (WMDs) to establish minimum flows and levels (MFLs) for priority water bodies within their jurisdictions. The statutes direct water management districts to prepare a priority list and schedule for the development of MFLs in November of every year.

The District informed the committee that the KB Planning Area contains 12 surface water bodies and the Floridan aquifer on the priority list (**Table 29**), which have been previously identified by the SFWMD. Lake Istokpoga is not currently on the MFL priority list and schedule. The District has made a commitment to consider whether Lake Istokpoga should be added to the list and schedule for establishment of a MFL during the next update of the list in November 2000 (letter dated December 3, 1999 from Kenneth G. Ammon, Director, Water Supply Planning, Permitting and Development, SFWMD). Future revisions to the list and schedule will reflect the understanding gained from this water supply plan on the potential for harm to the lake from water use withdrawals. In addition, the Restudy recommendation that the District and U.S. Army Corps of Engineers (USACE) review the regulation schedule for Lake Istokpoga will be considered.

Table 29. Minimum Flows and Levels Priority List and Schedule.

Surface Water	Year Established
Kissimmee River	2004
Lake Kissimmee	2004
Lake Tohopekaliga	2006
East Lake Tohopekaliga	2006
Alligator Lake	2006
Lake Jackson	2006
Lake Rosalie	2006
Cypress Lake	2006
Lake Hatchineha	2006
Lake Pierce	2006
Lake Marian	2006
Fish Lake	2006
Ground Water	Year Established
Floridan Aquifer	2004

Source: District Water Management Plan (SFWMD, 2000).

The District will coordinate with the USACE in establishing minimum flows and levels for the surface water bodies to ensure regulations schedules are consistent with the technical criteria established during the MFL process. In addition, the District will coordinate with the other water management districts in establishing minimum levels for the Floridan aquifer.

CONCLUSIONS

The results of this regional analysis indicate that historically used sources of water, primarily the Floridan aquifer in southern Orange County and northern Osceola County, may not be adequate to meet the future demands of the Kissimmee Planning Area during a 1-in-10 drought condition through 2020. Potential impacts on natural systems, as well as the potential for ground water quality impacts, are limiting the future use of this source. This points to the importance of coordinating with adjacent water management districts to investigate water source options that will meet long-term demands.

While the long-term, 20-year development of the Floridan aquifer is in question for southern Orange County and northern Osceola County, the immediate, short-term use of the Floridan can continue on a case-by-case basis while more information on potential impacts and limitations is being collected. The primary message of this plan for the Orange-Osceola County Area is that over the next five years, existing use of the Floridan aquifer can continue while additional data is collected and analyzed on potential impacts associated with increased use of the Floridan aquifer. As consumptive use permit applications requesting additional allocations are filed, they will be considered on a case-by-case basis. When determined appropriate, alternative sources and techniques to meet new demands may be required.

In the Lake Istokpoga-Indian Prairie Basin, the results of the surface water analysis indicate that the surface water availability during a 1-in-10 drought condition under the existing lake and canal storage network, is not adequate to support existing or projected, 2020 water supply demands. The solution to meeting these projected demands lies in changing the operation/management of Lake Istokpoga and obtaining additional supplies from Lake Okeechobee and/or the Kissimmee River. Both of these additional sources are highly controversial as they relate to potential impacts on these resources and water quality. The future use of water from Lake Okeechobee and the Kissimmee River depends upon resolution of issues that extend outside of this KB Planning Area and need to be resolved in context with the efforts in the other planning areas.

